



US005693977A

United States Patent [19][11] **Patent Number:** **5,693,977****Haddon et al.**[45] **Date of Patent:** **Dec. 2, 1997**[54] **N-CHANNEL FIELD EFFECT TRANSISTOR INCLUDING A THIN-FILM FULLERENE**[75] **Inventors:** **Robert Cort Haddon**, Dover; **Arthur Foster Hebard**, Bernardsville; **Thomas Theodorus Marie Palstra**, New Providence, all of N.J.[73] **Assignee:** **Lucent Technologies Inc.**, Murray Hill, N.J.[21] **Appl. No.:** **716,829**[22] **Filed:** **Sep. 5, 1996****Related U.S. Application Data**

[63] Continuation of Ser. No. 404,221, Mar. 15, 1995, abandoned.

[51] **Int. CL⁶** **H01L 27/14; H01L 31/00; H01L 29/04; H01L 31/036**[52] **U.S. Cl.** **257/431; 257/57**[58] **Field of Search** **257/431, 57**[56] **References Cited****U.S. PATENT DOCUMENTS**

5,009,958	4/1991	Yamashira	428/411.1
5,126,283	6/1992	Pintchovski et al.	437/188
5,171,373	12/1992	Hebard et al.	257/431

OTHER PUBLICATIONS

J. Kastner et al, "Fullerene Field-Effect Transistors", 1993, Springer Series in Solid-State Sciences, vol. 113, edited by H. Kuzmany et al, pp. 512-515.

Primary Examiner—Stephen Meier[57] **ABSTRACT**

An n-channel field-effect transistor is fabricated utilizing a thin-film fullerene (for example, C₆₀) as the active element. The fullerene film is deposited onto a device substrate in an ultra-high-vacuum chamber and is thus substantially oxygen-free. Subsequently, while still in the chamber, the fullerene film is encapsulated with a material that is impervious to oxygen.

6 Claims, 2 Drawing Sheets